

STUDY OF ALBUMIN-GLOBULIN RATIO IN THE SALIVA AND SERUM OF DIABETES MELLITUS PATIENTS IN JAMBI CITY

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ABSTRACT

Background: DM is a metabolic disorder that is genetically and clinically heterogeneous with manifestations of loss of carbohydrate tolerance. Resistance in type 2 DM affects carbohydrate, lipid and protein metabolism. Protein is a macronutrient that functions as the main source of energy reserves, cell and tissue building substances, regulating metabolic processes that play a role in the body's defense system. Total protein consists of Albumin, globulin and the ratio of Albumin-Globulin (RAG). RAG examination has the same function as the total protein assay in addition to that this examination is also to determine the typical factors to classify the level of systemic inflammation, in addition to this parameter is also simpler and less expensive.

Method: this study use analytical research with a case control and sampling used convenience sampling technique, the instruments is spectrophotometer, and the data analysis used mann-whitney test and kruskal wallis test.

Result: the result showed the average of AGR between saliva and serum control group was significant (0,049), but for the DM and DM-TB group there's no significant for DM (0,589) and DM-TB (0,176). The comparison among all groups for AGR saliva was no significant (0,183), also same for the AGR serum showed there no significant (0,283).

Conclusion: Based the result of the study that shows the differences between saliva and serum among the 3 groups but no significance. In saliva the average of DM group was the higher, but in the serum the average of DM-TB group was the higher.

Keywords: Serum; Saliva; Diabetes Mellitus; Albumin-globulin ratio

INTRODUCTION

The International Diabetes Federation reports that in 2021, 10.5% of the world's population will suffer from Diabetes mellitus (DM). Meanwhile, Indonesia itself occupies the 5th position in the world for DM sufferers who have been diagnosed with a total of 19.5 million people (Sun et al., 2022). Recorded by the Jambi Province health profile in 2022 as many as 45,781 people with diabetes mellitus in Jambi Province and in Jambi City alone reached 21,127 (Dinkes Provinsi Jambi, 2022).

DM is a metabolic disorder that is genetically and clinically heterogeneous with manifestations of loss of carbohydrate tolerance. Type 2 DM itself is a disease of hyperglycaemia due to cell insensitivity to insulin and a metabolic disorder characterised

by elevated blood sugar due to decreased insulin secretion by pancreatic beta cells and impaired insulin function (insulin resistance). Diabetes mellitus is characterised by several symptoms such as polydipsia (drinking a lot), polyuria (urinating a lot or often urinating at night), increased appetite but rapid weight loss, and fatigue (Fatimah, 2015).

The high incidence of DM will result in an increased incidence of TB. This is because the cellular immune system will decrease in patients with DM. In DM patients, the number of T lymphocytes and neutrophils are decreases, accompanied by a decrease in the number of T helper 1 (Th1) and the production of inflammatory mediators such as TNF α , IL-1 β and IL-6. If the number of Th1 lymphocytes is reduced, there will be a vulnerability of DM patients to TB because Th1 lymphocytes have an important role in

inhibiting the growth of mycobacterium tuberculosis bacilli. In addition, macrophages are also impaired which causes the inability to produce reactive oxygen species, as well as decreased chemotaxis and phagocytic functions (Niazi & Kalra, 2012).

Hyperglycaemia results from deficient insulin production, insulin resistance or both. Resistance in type 2 DM affects carbohydrate, lipid and protein metabolism. Protein is a macronutrient that functions as the main source of energy reserves, cell and tissue building substances, regulating metabolic processes that play a role in the body's defence system. Total protein consists of Albumin, globulin and the ratio of Albumin - Globulin (RAG). Hyperglycaemia will increase protein and fat catabolism due to decreased insulin action. This causes changes in plasma protein levels and composition, in addition, in DM there is an inflammatory state, so there is an increase in the synthesis of acute proteins and other proteins that cause inflammation-related protein levels to increase. Several studies have reported that insulin deficiency can cause a decrease in the rate of albumin and fibrinogen synthesis (Rachma et al., 2023).

RAG examination has the same function as the total protein assay in addition to that this examination is also to determine the typical factors to classify the level of systemic inflammation, in addition to this parameter is also simpler and less expensive (Malik et al., 2010). Examination of blood specimens causes discomfort and trauma to the patient. It is optimized to use other biological fluids (American Diabetes Association, 2012). one such example is saliva. The use of saliva specimens is a much easier and non-invasive tool to diagnose and monitor diabetes, which is much needed in the current situation (Nirmala & Sultana, 2021). Saliva shows its own superiority when compared to other biological fluids. In addition, saliva is a "real time" fluid because it is secreted from an exocrine gland which also shows a picture of protein levels which is

a picture of how a person's health status and ability to collect samples. Because of this, it is possible to monitor some biomarkers in infants, children, the elderly, and patients who are uncooperative when collecting blood or urine samples due to several situations (Hassaneen & Maron, 2017).

METHODS

The research to be conducted uses analytical research with a case control design, using the observational method and sampling using convenience sampling technique. With the sample were healthy controls, DM patients, and DM-TB patients. the number of samples in this study were 15 healthy controls, 15 DM patients, and 20 DM-TB patients the total is 50 respondents. By inferring specimens, which are saliva and serum. the instrument used is a spectrophotometer. Data analysis used in this research is mann-whitney test and kruskal wallis test.

RESULTS AND DISCUSSION

In a study conducted in March-June 2024 in Jambi City, the following results were obtained, with the characteristics of respondents consisting of age, gender, and length of illness.

3.1 Respondent Characteristics

Table 1. Respondent characteristics

	Control		DM		DM-TB	
	N	%	N	%	N	%
Gender						
- Male	5	33,3%	9	60%	10	50%
- Female	10	66,7%	6	40%	10	50%
Age						
- 18-60 years	15	100%	9	60%	16	80%
- >60 years	0	0%	6	40%	4	20%
Length of illness						
- 1-5 years	0	0%	5	33,3%	14	70%
- >5 years	0	0%	10	66,7%	6	30%

The respondents of this study consisted of 3 groups, they were health control, DM patients, and DM-TB patients. From the table we can the characteristic got divide to 3 categories.

In control group there more female respondent than male respondent, but in DM group there more male respondent than male respondents, for the DM-TB group have same number of male and female responden.

Based of the age, calculate from all group there more 18-60 years respondent than the >60 years respondent. For the length of illness in DM group there more respondent with length if illnes more than 5 year but in DM-TB group had more respondent with length of illnes less than 5 years.

Table 2. AGR of Saliva- Serum control

	N	mean	P- value
Saliva	15	0,7320	0,049
Serum	15	0,9427	

The table show the comparison of AGR of saliva and serum on health control. The p-value of the comparison is 0,049 or <0,05 that's mean it was significant between saliva and serum. It show AGR on serum was higher than on saliva in control group.

3.2 Albumin-Globulin Ratio

Table 3. AGR of saliva-serum DM

	N	mean	P- value
Saliva	15	1,1193	0,589
Serum	15	0,8093	

The table show the comparison of AGR of saliva and serum on DM group. The p-value of the comparison is 0,589 or >0,05 that's mean it was no significant different between saliva and serum.

The table show saliva was higher than serum on DM group. The increase of AGR saliva compare to serum, the greater micro-organism activity or protein of periodontol origin can be the cause for increased salivary protein. High levels of salivary total protein than serum in DM patients due to extra proteins addes to saliva derived from the gingival fluid by active periondontal disease activity. Increased basement membrane permeability, which often associated with DM, is one of the possibilities for the increased passage of protein from the exocrine glands into their secretions(Lodgotra et al., 2016).

Table 4. AGR of Saliva-serum DM-TB

	N	mean	P- value
Saliva	20	1,0355	0,176
Serum	20	2,1050	

The table show the comparison of AGR of saliva and serum on DM-TB group respondent, the p-value of the comparison is 0,176 or >0.05 which is mean there no significance different.

The table show that serum have higher average than the saliva in DM-TB group it the opposite DM group. Salivary levels in DM were variable in different paper and at sometimes contradictory. The decrease was due to protein utilization by other biochemical metabolic pathways as an overall systemic response to glucose intolerance, (Virginia et al., 2016) explained such difference in their study by the fact that assay was performed immediately after collection where centrifugation of the saliva sample was carried out to prevent endogenous proteolytic activity.

Therefore, this contradiction can be explained by the different used methods was carried out, techniques and type of salivary collection like the stimulated or unstimulated collection of saliva, different salivary sample analysis, different glucose metabolic contol methods, as well as, the type diabetes and duratin of the disease (Razooki Hasan et al., 2019).

Table 5. AGR Saliva

	N	Mean	p-value
Control	15	0,7320	0,183
DM	15	1,1193	
DM-TB	20	1,0355	

The table show the comparison of AGR saliva among the groups. It show the p-value is 0,183 or >0,050 which is mean theres no significance differents among the saliva per group. The table also show the average of saliva were higher in DM group (1,1193) and the lowest in control group.

The increase was may be explained on the basis that saliva can serve as partial filtrate of blood which contain serum components transported from capillaries into

saliva diffusion, active transport, or ultra-filtration via gingival sulcus (Naing & Mak, 2017).

Glucose metabolic products lead microvascular changes in blood vessel and basal membranes of cells in salivary glands and oral tissue which lead to a change in salivary composition which include organic and inorganic components associated with increased basement membrane permeability and increased passing of molecules from exocrine gland into their secretions. All this cause easier movements proteins from blood to saliva dan gingival fluid (Gupta et al., 2015).

Table 6. AGR Serum

	N	Mean	p-value
Control	15	0,9427	
DM	15	0,8093	0,283
DM-TB	20	2,1050	

The table show the comparison of AGR serum among the groups. It show the p-value is 0,283 or >0,050 which is mean theres no significance different per group. The table also the average of serum were higher in DM-TB group (2,1050) and the lowest in DM group.

Albumin and globulin are two primart components of serum proteins and are involved in systemic inflammation. Low albumin levels are associated with malnutrition and inflamatio, whereas low globulin levels are associate with chronic inflammation and indicate cumulative exposure to various pro-inflammatory cytokines. AGR is considered a more stable and realiable marker than serum albumin or globulin alone as prognostic factor and has been associated with poor results in relation to different pathologies, such as disgestive and urological cancers in general. In infectious diseases, AGR was associated with worse prognosis in pedatric patients with tuberculosis and meningitis as predictor of febrile urinary tract (Ulloque-badaracco et al., 2022).

In air infection like mycobaterium tuberculosis, it is expected that changes in plasma protein levels will occur in patients. However, the change in level of each protein at any particular time usually reflects the net effect of the rate of synthesis and rate of catabolism as a result of host microbe interaction. In chronis infectious TB disease, the albumin shows a decrease while globulin content shows an increase leading to low albumin to globulin (A/G) ratio an albumin to alpha-2 globulin ratio (Shingdang et al., 2016)

CONCLUSION

Based the result of the study that shows the differences between saliva and serum among the 3 groups but no significance. In saliva the average of DM group was the higher, but in the serum the average of DM-TB group was the higher.

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CONFLICT OF INTEREST

All authors declared that there was no conflict of interest.

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